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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/917,837

07/31/2001

Ehud Karmin

KARNIN=1

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7590

12/29/2004

BROWDY AND NEIMARK, P.L.L.C.

624 NINTH STREET, NW

SUITE 300

WASHINGTON, DC 20001-5303

EXAMINER

AGHDAM, FRESHTEH N

ART UNIT

PAPER NUMBER

2631

DATE MAILED: 12/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/917,837

Applicant(s)

KARNIN ET AL.

Examiner

Freshteh N. Aghdam

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 03 July 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 14-21 is/are rejected.
- 7) ☒ Claim(s) 9-13 and 22-26 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 6, 7, 8, 14, 19, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wallace (US Patent 6,473,467) and further in view of Demjanenko (Pub. 2002/0131524).

As to claims 1 and 14, Wallace teaches a method for multi-user detection wherein a complex input signal (Fig. 5B, Col. 23, Lines 41-48) due to a superposition of transmitted signal that were encoded (Fig. 3, Blocks 312a,..., 312k; Col. 19, Lines 55-57) and transmitted along transmitters (Fig. 1A, Blocks 114A, ..., 114T and 116A, ..., 116T) in a common frequency band is received, sampled over a time period to provide a sequence of complex samples, determining the soft decision values by processing the sequence of samples corresponding to the transmitted symbols received from plurality of transmitters, and estimating the transmitted symbols by determining the difference between the soft decision on the symbols and the closest QAM constellation value (Fig. 1A, 3, 5B, and 6; Col. 3, Lines 55-67; Col. 19, Lines 1-5; Col.24, Lines 26-38). Wallace is silent about the encoding symbols in a real valued constellation in the

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transmitters and constraining the soft decision values to be real values.

Demjanenko, in the same field of endeavor, teaches using independent I and Q decoding techniques that constrains the soft decision values to be real values wherein each decoder provides decision values (i.e. soft or hard decision values based on the type of the decoder is used) for each inputted symbol with respect to each of the symbols of one of the constituent constellations that were assigned to in the transmitter (Fig. 43 and 44, Blocks 100 and 102; Pg. 7, Par. 179 and 180). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teaching of Demjanenko with Wallace in order to reduce the amount of processing required for decoding (Pg. 2; Par. 33).

As to claims 6, 7, 19, and 20, Wallace discloses that stream of modulation symbol vectors (i.e. at least one symbol vector) are obtained during the observation period (Fig. 6; Col. 24, Lines 44 and 45).

As to claims 8 and 21, Demjanenko teaches applying independent I and Q encoding and decoding techniques to provide decision values that could be soft or hard decision values based on the type of decoder is used (Pg. 7, Par. 180).

Claims 2 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wallace and Demjanenko, further in view of van Nee (US Patent 6,175,550).

As to claims 2 and 15, Wallace and Demjanenko teach all the subject matters claimed above, except for the waveforms comprising code-division multiple access (CDMA) waveforms and the symbols are modulated by respective spreading codes to generate the waveforms. van Nee, in the same

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field of endeavor, discloses that using CDMA is advantageous over OFDM (Col. 9, Lines 14-16). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teaching of van Nee with Wallace and Demjanenko in order to reduce multi-user interference caused by frequency offsets, which may introduce some correlation between carriers of different users (Col. 9, Lines 14-16).

Claims 3 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wallace, Demjanenko, and van Nee, further in view of Levison (US Patent 6,366,938).

As to claims 3 and 16, Wallace, Demjanenko, and van Nee teach all the subject matters claimed above, except for the spreading codes to be complex valued. Levison, in the same field of endeavor, teaches using complex spreading codes to spread a CDMA signal (Col. 14, Lines 59-62). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teaching of Wallace, Demjanenko, and van Nee with Levison in order to represent the complex values that could be any of the four constellation points (Col. 14, Lines 59-62).

Claims 4, 5, 17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wallace and Demjanenko, further in view of Chulajata (US Patent 6,434,375).

As to claims 4 and 17, Wallace and Demjanenko teach all the subject matters claimed above, except for the constellation of the symbols consists of the values +1 and -1. Chulajata discloses that the constellation of the symbols to be

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+1 and -1 (Col. 4, Lines 34-37). Therefore, it would have been obvious to one of ordinary skill in the art to combine the teaching of chulajata with Wallace and Demjanenko in order to reduce the amount of processing required for coding.

As to claims 5 and 18, Wallace and Demjanenko teach all the subject matters claimed above, except for obtaining the hard decision values from the soft decision values by taking the signs of the soft decision values. Chulajata, in the same field of endeavor, teaches determining the hard decision variable by taking the sign of the soft decision variable (Col. 12, Lines 11-13).

#### ***Allowable Subject Matter***

Claims 9-13 and 22-26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record fails to teach a method according to claims 9 and 22 wherein the real and imaginary parts of the samples are related to the transmitted symbols by the claimed expression.

The prior art of record fails to teach a method according to claims 10 and 23 wherein inverting the expression comprises finding the real values of the elements of  $b$  that minimize a norm cited in claims 10 and 23.

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The prior art of record fails to teach a method according to claims 11 and 23 wherein finding the real values of the elements of  $b$  comprises calculating a vector " $b\sim$ " of the soft decision values cited in claims 11 and 24.

The prior art of record fails to teach a method according to claims 12 and 25 wherein inverting the expression comprises decomposing " $s$ -" to yield an upper-triangular matrix  $T$  that satisfies an equation  $z = Tb + v_1$  and finding the real values of the elements of  $b$  iteratively beginning from a final one of the elements so as to solve the equation.

The prior art of record fails to teach a method according to claims 13 and 26 wherein processing the sequence of complex samples comprises ordering the elements of  $b$  in an ascending order of power of the waveforms transmitted respectively by the transmitters, and ordering the entries in " $s$ -" ( $s$  bar) according to the order of the elements in  $b$ , so that finding the real values iteratively comprises finding the real values beginning from one of the transmitters having a high power relative to the other transmitters.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Schmidl (US Patent 6,725,025), Tsatsanis (US Patent 6,445,692), Shattil (US. Pub. 2003/0147655), Rouphanel (US Pub. 2001/0030990), and Jones (US Patent 6,442,130).

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Freshteh N. Aghdam whose telephone number is (571) 272-6037. The examiner can normally be reached on Monday through Friday 9:00- 5:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Freshteh Aghdam

December 22, 2004

  
**MOHAMMED GHAYOUR**  
**SUPERVISORY PATENT EXAMINER**



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